

**UltraViolet Multi-Filter Rotating Shadow Band Radiometer (UVMFRSR-454)
Raw Count Calibration 2004 February.**

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The Yankee Environmental Systems Inc., Multi-Filter Rotating Shadow Band Radiometer (UVMFRSR-454) was located at the Mauna Loa Observatory (MLO) island of Hawaii during 2004 January, to perform calibration measurements. These measurements are used to calculate the Top Of Atmosphere (TOA) values as measured by UVMFRSR-454. The TOA results of these raw count measurements are present here.

Applicable period, 2002 January through the present.

NOTE: U95=2.0* standard deviation

Date of measurements, 2004 January.

Mean Value TOA Results

Wavelength	Top of Atmosphere value	Standard deviation
299.7 nm	177715 counts	17811 counts
304.5 nm	58385 counts	1570 counts
310.7 nm	14299 counts	350 counts
316.8 nm	7810 counts	119 counts
323.6 nm	9250 counts	91 counts
331.7 nm	7350 counts	72 counts
367.2 nm	7766 counts	71 counts

Supporting discussion follows.

Filters

The wavelengths filters have been changed during the life of the instrument. A graphical representation of the filter changes and MLO measurement periods is presented in Figure 1.

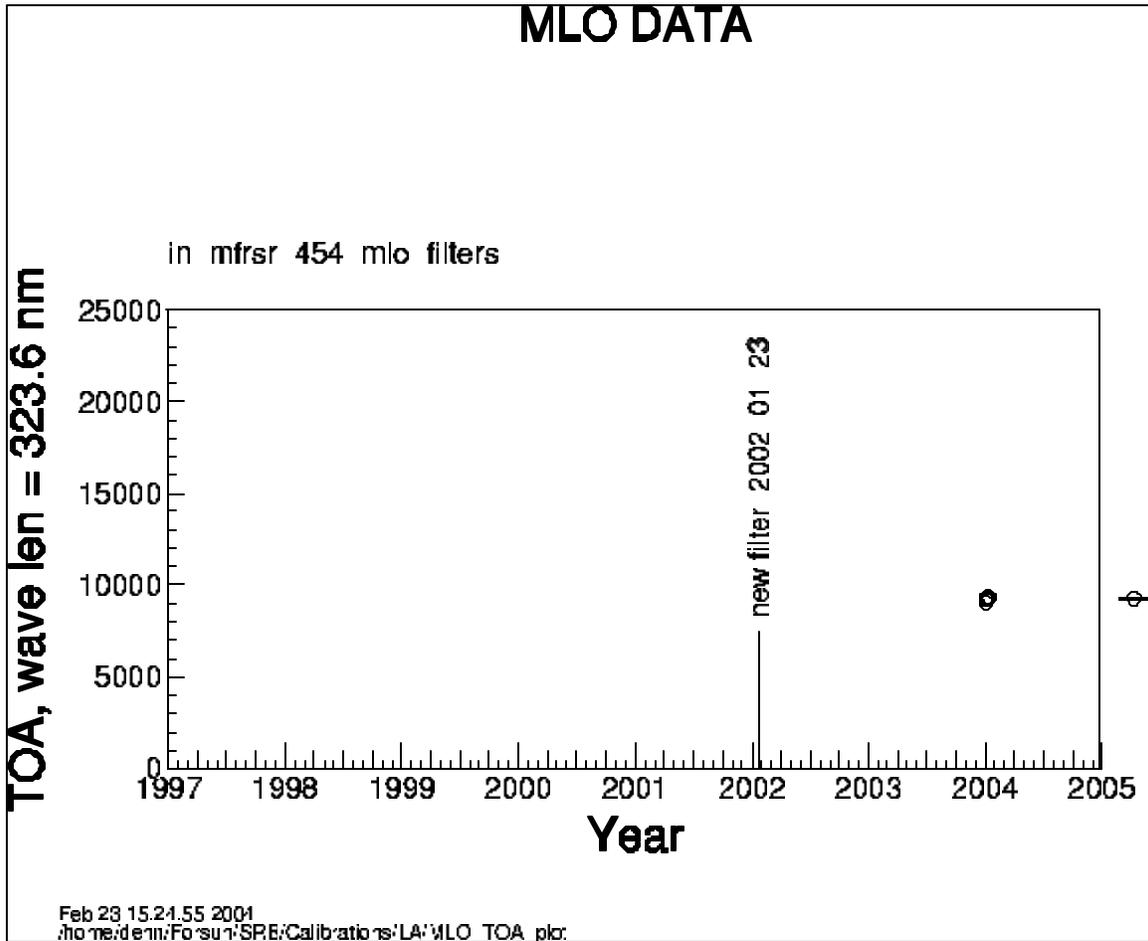


Figure 1. Graphical display of filter changes and MLO data collection periods. The circles are the Langley determined Top Of Atmosphere values. The filter changes are marked by a vertical line which is dated.

Langley Analysis

Langley analysis consists of determining the irradiance as the sun rises or sets. Sunrise periods are preferred because the afternoon atmosphere is less stable due to solar heating. During these periods the direct beam irradiances are measured at one minute or smaller intervals. The atmospheric path lengths are calculated (directly overhead is defined as an atmospheric path length of 1 regardless of the measurement location). A straight line is fit to the log of the irradiance (y value) and the atmospheric path length (x value). This straight line is then extrapolated zero atmospheric path lengths. This extrapolated value is the Langley determined Top Of Atmosphere value. The range of atmospheric path lengths chosen here is 2 to 5. Below 2, the data points are too numerous and will unduly influence the fit. The maximum of 5 was chosen because a similar analysis has been performed on data collected at the Clouds and Earth's Radiant Energy System (CERES) Ocean Validation Experiment (COVE) Site. COVE data for atmospheric path lengths greater than 5 are unusable because of haze. A sample plot of Langley analysis is shown in Figure 2.

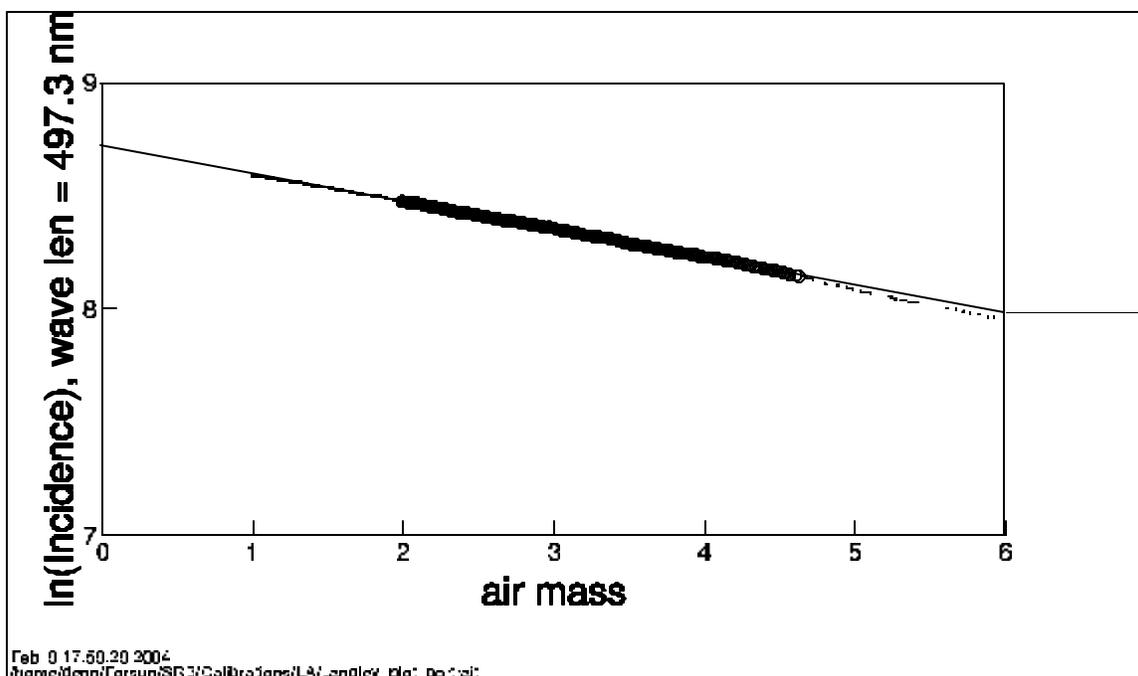


Figure 2. An example of Langley analysis. The vertical axis is the log of the direct beam irradiance. The horizontal axis is the atmospheric path length, in atmospheric path length units. The symbols and dots are the logs of the direct beam irradiance. A straight line is fit to this data and extrapolated to zero atmospheric path lengths.

Spectral Response

Figure 3 is an example of the spectral response of UVMFRSR-454. These measurements were provided by the manufacturer.

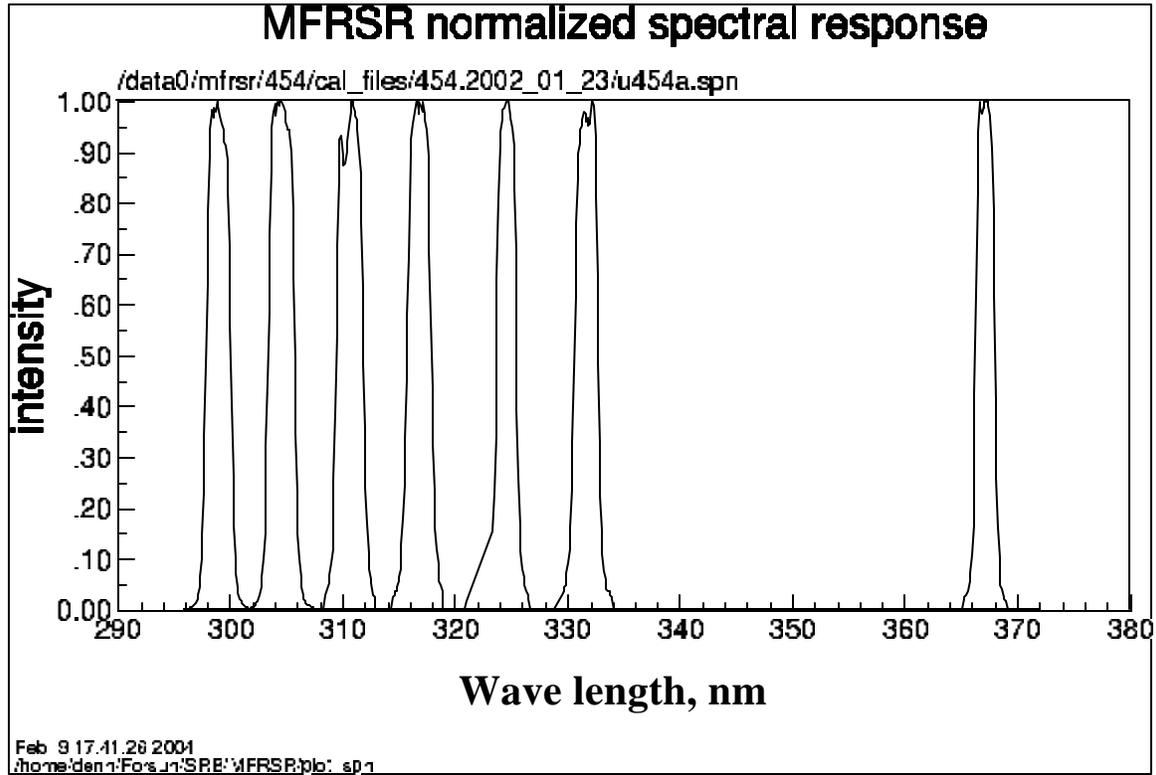


Figure 3. An example of normalized spectral response data for the 7 UVMFRSR-454 narrow band channels, nominally 300, 305, 311, 317, 324, 332, and 367 nm. This data is from the 2000 February filter change.

Top Of Atmosphere Results

Figures 4 through 10 show the TOA results for each wavelength. The mean and standard deviation of the TOA values are determined. Another parameter, 'std_dev_mean', comes from the Langley fit for each point and is the mean of these points. This mean is then combined with the standard deviation of the TOA values using the root some square method to get 'std_dev_combined'. These values are displayed in each figure.

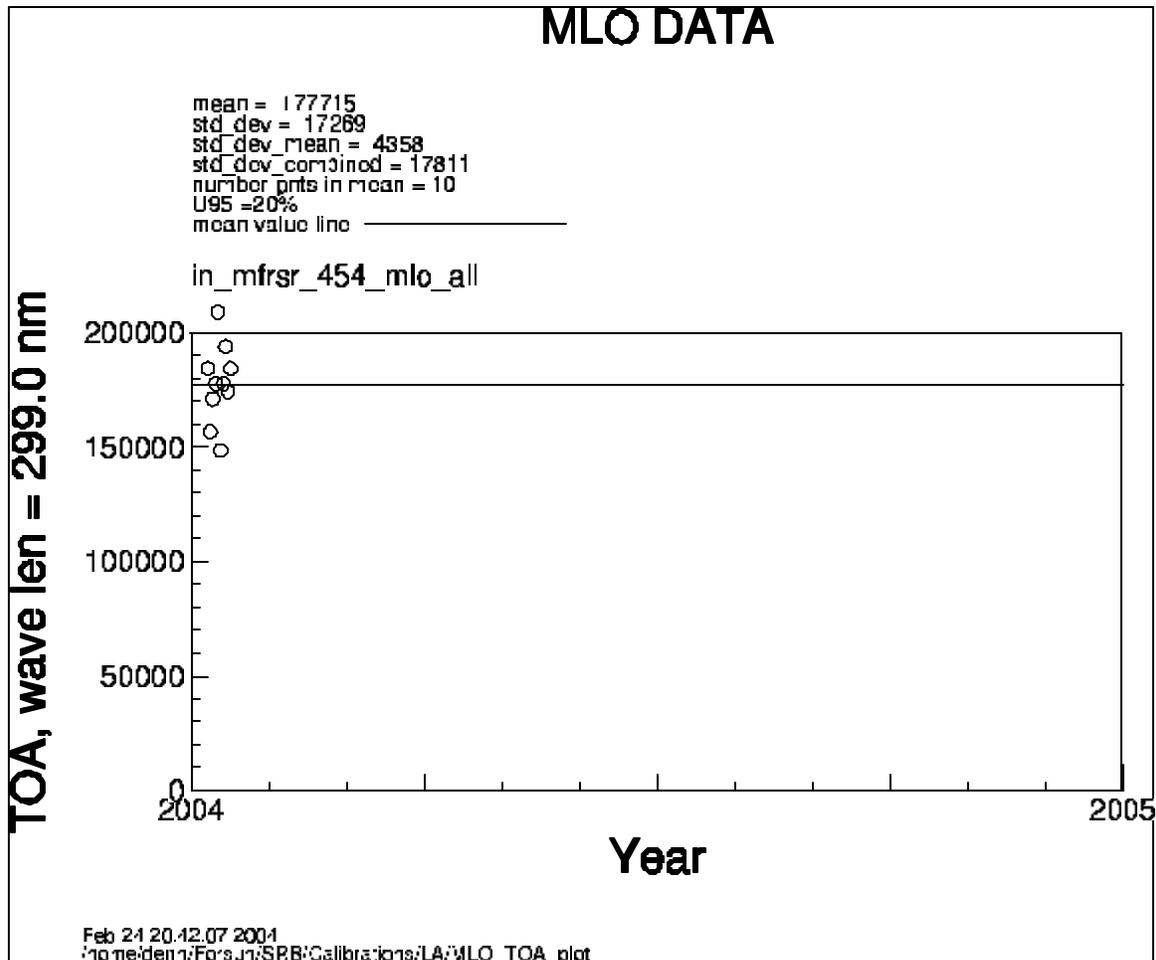


Figure 4. MLO TOA data collected during 2004 January for wavelength 299.0 nm.

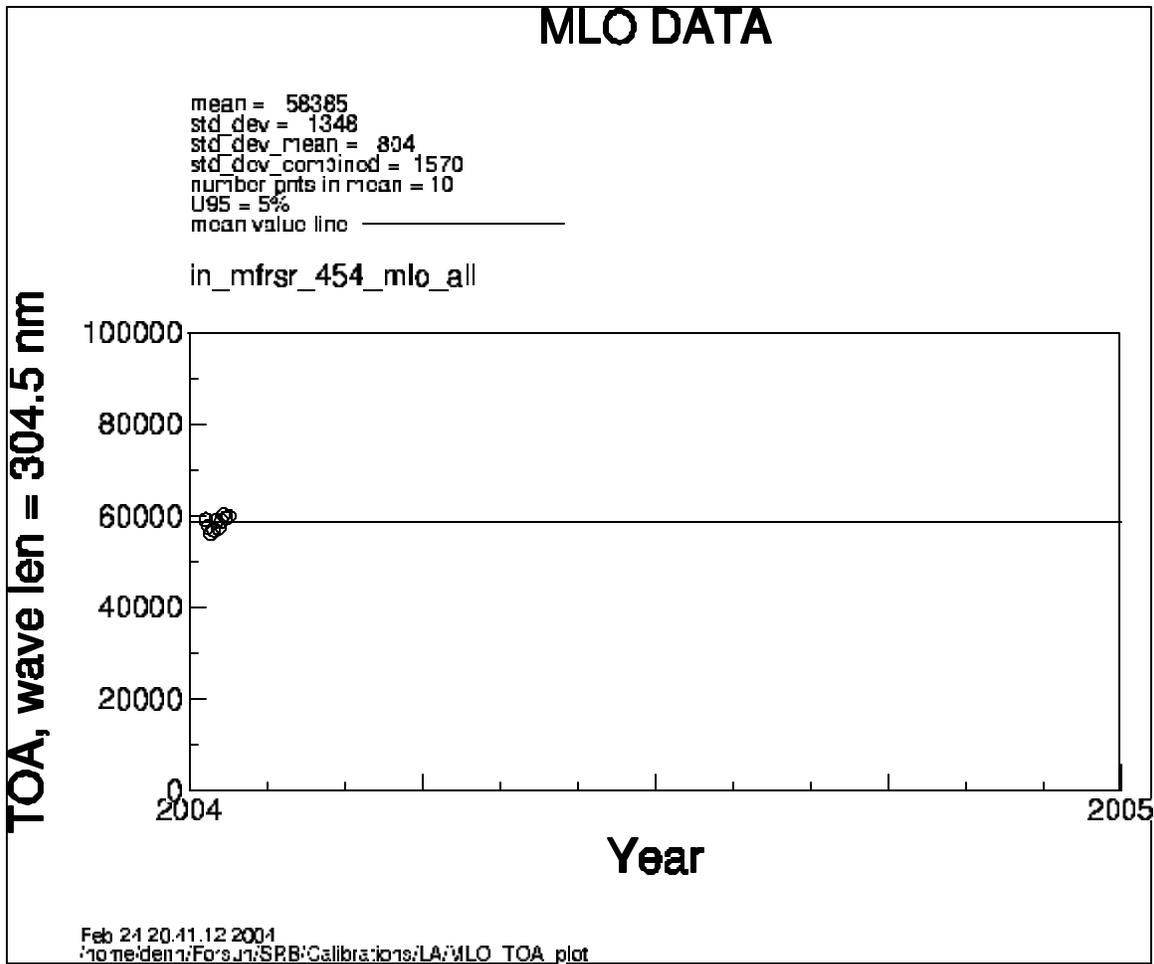


Figure 5. MLO TOA data collected during 2004 January for wavelength 304.5 nm.

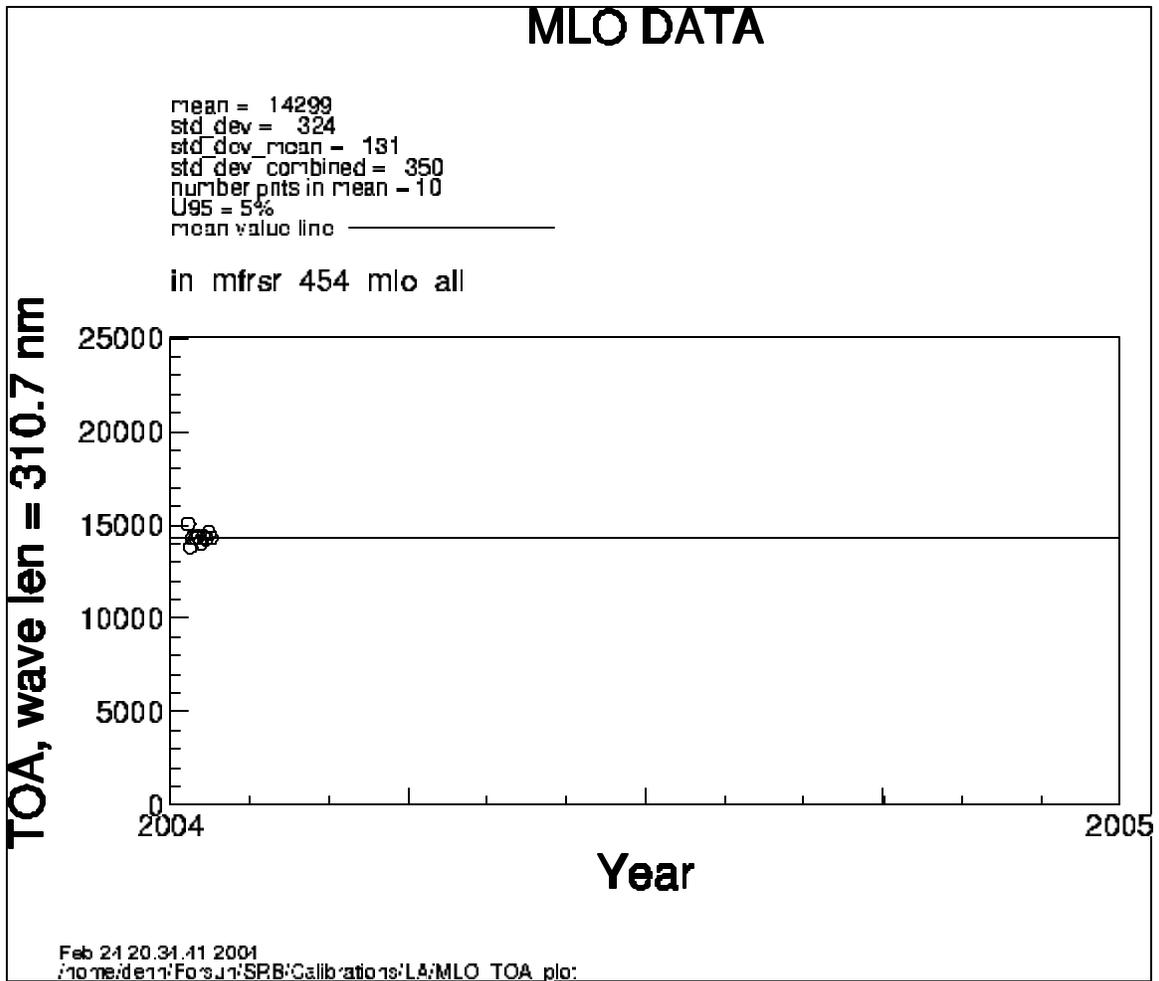


Figure 6. MLO TOA data collected during 2004 January for wavelength 310.7 nm.

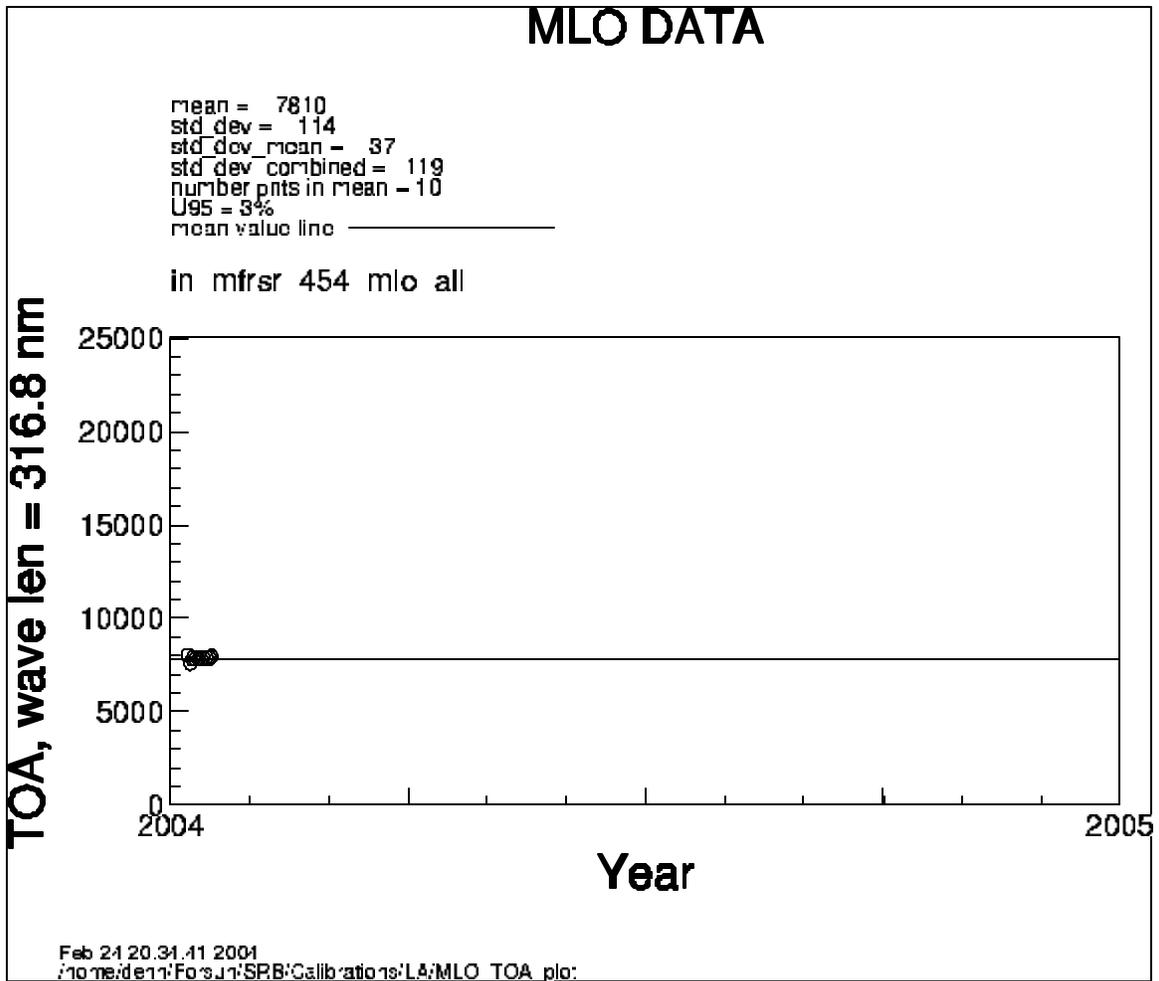


Figure 7. MLO TOA data collected during 2004 January for wavelength 316.8 nm.

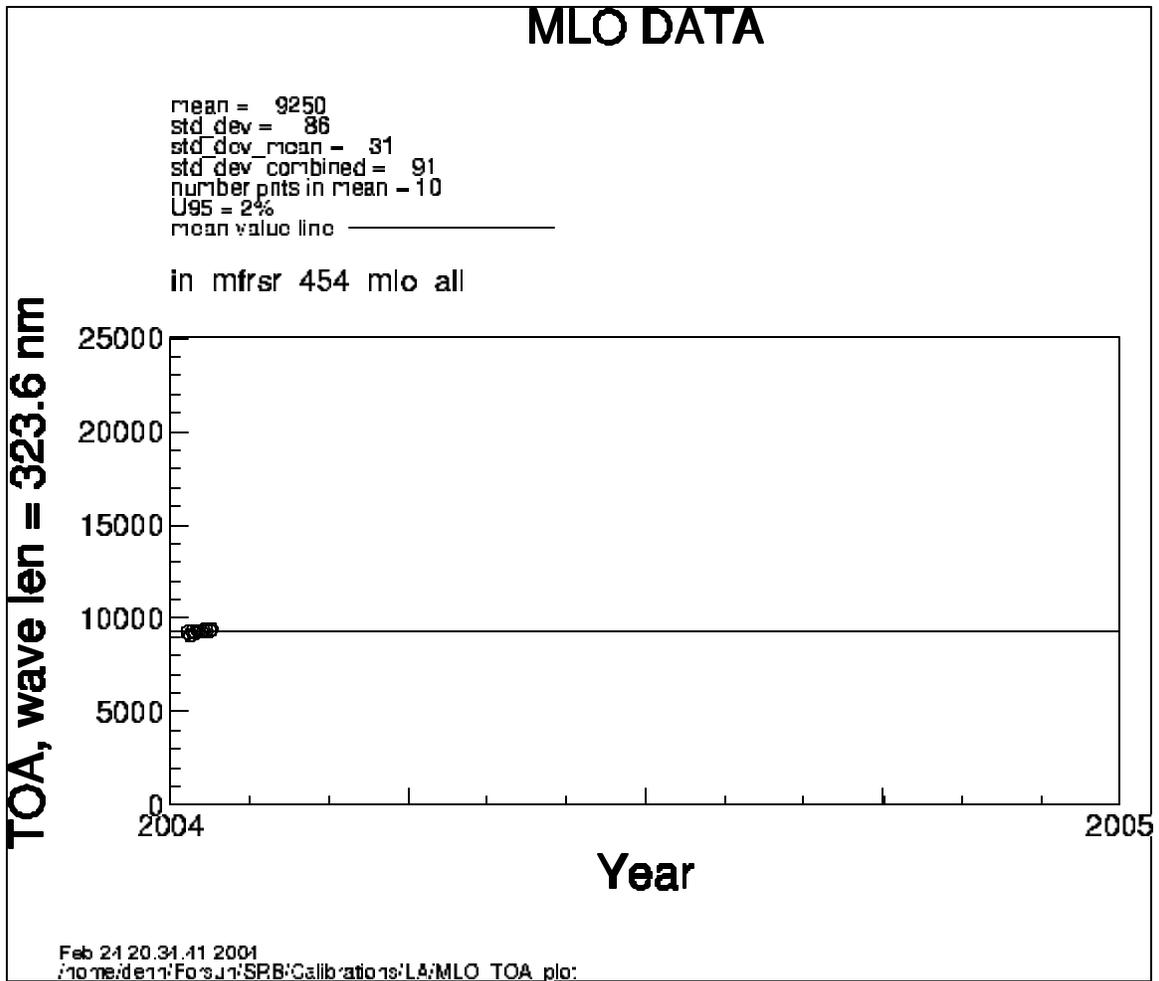


Figure 8. MLO TOA data collected during 2004 January for wavelength 323.6 nm.

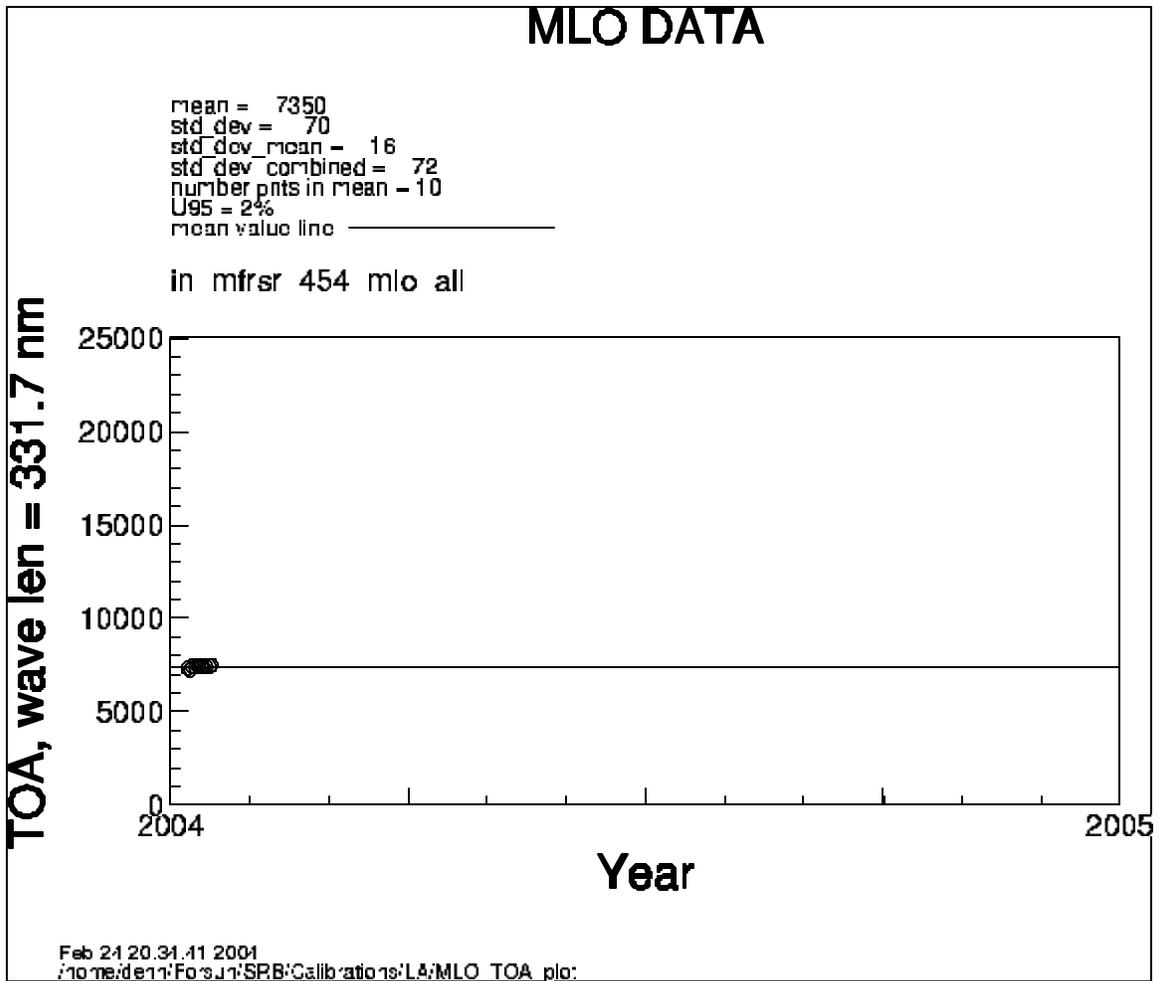


Figure 9. MLO TOA data collected during 2004 for wavelength 331.7 nm.

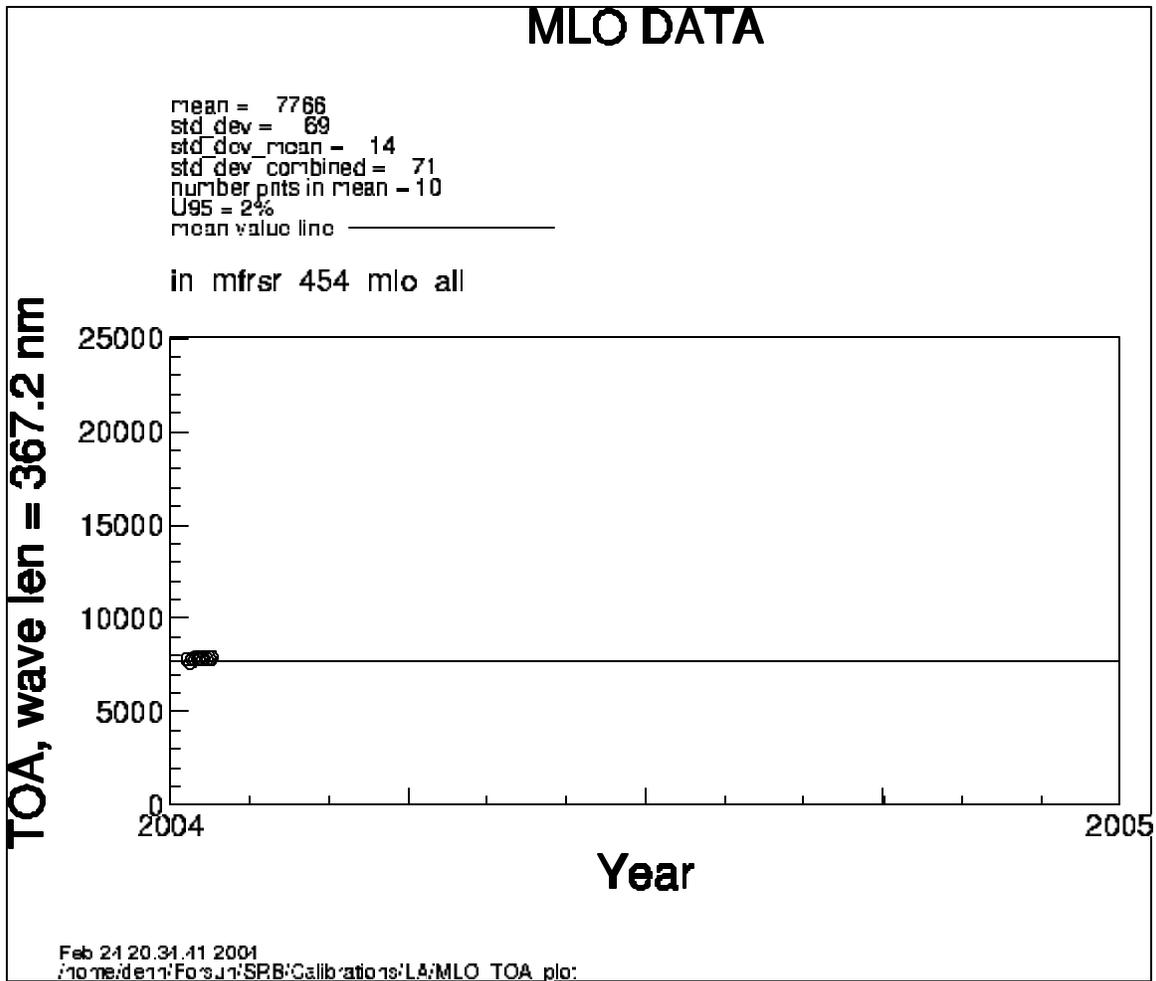


Figure 10. MLO TOA data collected during 2004 January for wavelength 367.2 nm.

Results

The final results of this analysis are presented here and at the beginning of the report.

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Date of measurements, 2004 January.

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